A Rare Presentation of Tuberculosis in Transplanted Kidney on Fluorodeoxyglucose Positron Emission Tomography with Computed Tomography Scan

Abstract

Tuberculosis (TB) is currently the world's leading cause of infectious mortality. Infective complications are common after renal transplantation. TB is one of the leading infections following renal transplantation; however, TB affecting the transplanted kidney is a rare presentation. Reactivation of the *Mycobacterium tuberculosis* is the most common mode of infection. The use of immunosuppressive agents such as cyclosporin, azathioprine, and steroids advance the onset of TB to an earlier date which most often presents as a fever or pyrexia of unknown origin (PUO). The use of 18F-fluorodeoxyglucose positron emission tomography with computed tomography (18F-FDG-PET/CT) scan images of the whole body and provides the metabolic map of the infection as well as also helps in its radiological localization and characterization and selecting the most appropriate site of the biopsy. Currently, the combined FDG-PET/CT scan modality is the investigation of the choice of physicians for the diagnosis of PUO. Not only the diagnosis but 18F-FDG-PET/CT is also very valuable in assessing early disease response to therapy, and plays an important role in cases where conventional microbiological methods are unavailable for monitoring response to the therapy in cases of pulmonary, extrapulmonary, or multidrug resistant TB.

Keywords: *Fluorodeoxyglucose positron emission tomography, pyrexia of unknown origin, transplant kidney, tuberculosis*

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Introduction

Tuberculosis (TB) is currently the world's leading cause of infectious mortality. Infective complications are common after renal transplantation.[1] *Mycobacterium tuberculosis* (*M. tb*) is a relatively slow-growing complex acid-fast bacillus that is able to survive in harsh microenvironments within patients in a quiescent state. The 18F-FDG-PET/CT scan is a very valuable tool in assessing early disease response to therapy, and plays an important role in cases where conventional microbiological methods are unavailable for monitoring response to the therapy in cases of pulmonary, extrapulmonary or multi drug resistant tuberculosis.[2] After exposure to *M. tb*, an estimated 20%–25% of the individuals become infected. One-fourth of the world's population is latently *M. tb* infected, and approximately 3%–5% of these infected individuals will progress toward developing active tuberculosis (TB) disease during their lifetime.[3] Pulmonary disease is present in more than 80% of TB cases, while extrapulmonary TB (EPTB) occurs in about 20% of cases but can be seen in more than 50% of cases in immunosuppressed populations such as in HIV patients.[4] The recipients of solid organ transplantation are more vulnerable than the general population to acquiring TB.

Case Discussion

We describe the case of a 58-year-old female who presented with complaints of pyrexia of unknown origin (PUO) for 1 month and weight loss of around 3 kg. This patient was a known case of diabetes mellitus and hypertension with status post allograft renal transplantation 5 years back in 2016, on immunosuppressive therapy cyclosporin and methylprednisolone, having a history of renal graft pyelonephritis (Klebsiella) in 2017 as well as acute cellular rejection (graft failure) in December 2021, which she recovered after receiving pulse methylprednisolone therapy. This patient presented with a fever of about

How to cite this article: Rathore H, Thaker N. A rare presentation of tuberculosis in transplanted kidney on fluorodeoxyglucose positron emission tomography with computed tomography scan. Indian J Nucl Med 2023;38:177-9.

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Received: 27-07-2022
Revised: 07-11-2022
Accepted: 24-12-2022
Published: 08-06-2023

Access this article online

Website: www.ijnm.in

DOI: 10.4103/ijnm.ijnm_129_22

Quick Response Code:

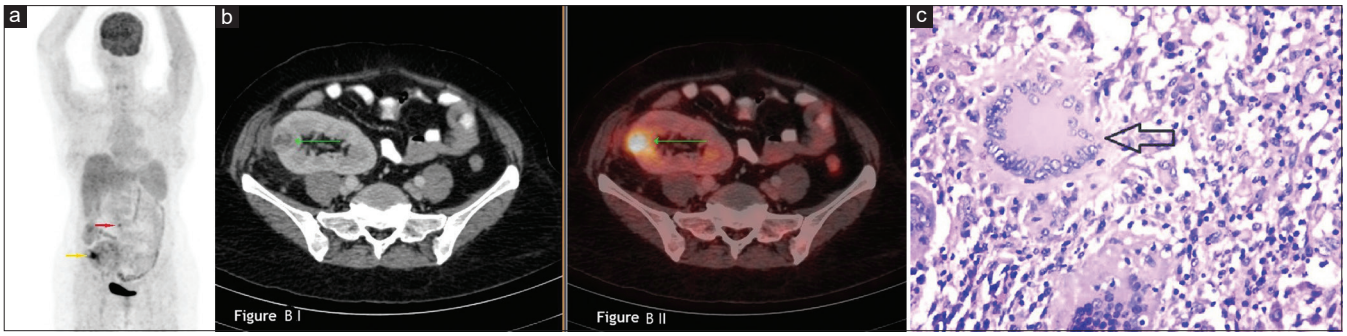

Figure 1: (a) Whole-body FDG PET/CT scan MIP image reveals a transplanted kidney in the right iliac fossa with focal increased metabolic activity in its lower pole lateral cortex (yellow arrow), and an FDG avid precaval node (red arrow). Rest of the visualized body reveals physiological FDG uptake. (b) The CECT (B I) and Fused FDG PET/CT image (B II) in axial views reveal focal pathological increased metabolic activity (SUVmax 12.5) in the peripherally enhancing centrally necrotic area in the lower pole lateral cortex of the transplanted kidney with adjoining perinephric fat stranding (green arrows). (c) Histopathology showing granulomatous inflammation with caseous necrosis (black arrow). FDG PET/CT: Fluorodeoxyglucose positron emission tomography with computed tomography, MIP: Maximum intensity projection, CECT: Contrast-enhanced computed tomography

100°F to 102°F for over 4 weeks which was occasionally associated with chills and usually presented in the night and in the early morning. The patient also complained of loss of appetite for the same period with a loss of weight around 4 kg and occasional vomiting. There is no history of cough, expectoration, abdominal pain, or burning micturition. The complete blood count revealed mild cytopenia in the form of low total leukocyte count (about 3500) with predominant leucopenia and low hemoglobin (8.9 g/dL). The rest of the blood counts, liver, and renal function tests, including serum creatinine and uric acid, were unremarkable. The erythrocyte sedimentation rate was mildly elevated (53 mm/h). The chest radiograph, routine urine microscopy, and staining, and blood culture were also normal. The patient was hence referred to Nuclear Medicine Department for an 18F-FDG-PET/CT scan to determine the cause of PUO. The FDG-PET/CT scan was carried out with intravenous iodinated contrast, and revealed an *in situ* transplanted kidney in the right iliac fossa with a pathological focal metabolically active peripherally enhancing centrally necrotic area in the lower pole lateral cortex of the transplanted kidney along with adjoining perinephric fat stranding, the SUVmax being 12.5 [Figure 1a and b]. Few FDG-avid small subcentimeter-sized locoregional lymph nodes were also seen in the adjoining precaval and right common iliac regions with a SUVmax of 7.5 in the precaval node. The lungs and rest of the body were fairly unremarkable on PET/CT scans. These findings were suggestive of focal pyelonephritis with associated necrosis in the lower pole of the transplanted kidney. The patient was further evaluated by USG-guided biopsy of the transplanted kidney lesion, and the sample was sent for histopathological examination and culture, which demonstrated acute granulomatous inflammation and concomitant caseous necrosis [Figure 1c] and mycobacterium TB bacilli, with the PCR testing, also confirming the DNA of tubercular bacilli. The patient was hence started on first-line antitubercular drugs as a new case under directly observed treatment short course with relief of symptoms and improvement in appetite seen within a week of treatment onset.

TB is one of the most common bacterial infections with a high prevalence in developing countries like India. Besides other infections like cytomegalovirus, the downgrade host immunity can activate occult TB infection. TB is still one of the major causes of mortality and morbidity in developing countries, imposing a significant financial burden on the patient with the emergence of drug-resistant variants, further causing a severe impact on the management and prognosis.

Conclusion

TB in the allograft renal transplant recipient is a common problem, particularly in developing countries where the incidence and prevalence are very much higher, but the TB affecting the transplanted kidney[5] is barely documented on an 18F-FDG-PET/CT scan, as in this case. The presentation of the disease in solid organ recipients is different from pulmonary and EPTB. FDG PET/CT scan is, however, a very sensitive diagnostic modality for evaluation of PUO by not only facilitating the anatomical localization and characterization of the pathological focal increased metabolic activity, thereby guiding further intervention and treatment, but is also a very valuable tool in monitoring response to the anti-Koch's therapy in cases of pulmonary, extrapulmonary and multidrug-resistant TB.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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